

Listing of Claims:

1. (Currently Amended) A total internal reflection
fluorescence microscope comprising:

at least one objective lens which takes light from a
specimen;

5 an image pick-up device which picks up an image of the light
taken into the objective lens;

an observation optical path via which the light taken into
the objective lens is condensed onto the image pick-up device;

a condenser lens, which is disposed in a position facing the
10 objective lens via the specimen, and which has a numerical
aperture that makes possible total internal reflection
illumination, and which guides a transmitted illuminative light
into the specimen;

a base including an upper portion that holds the condenser
15 lens;

a laser oscillation unit which outputs a laser beam;

an optical fiber which transmits the laser beam output from
the laser oscillation unit;

a reflection mirror provided at a lower portion of the base
20 to introduce the laser beam output from the optical fiber into a
vicinity of an outermost portion of the condenser lens; and

a condensing lens which condenses the laser beam output from the optical fiber, such that the laser beam is condensed at a condensing position in a vicinity of a front focal position of the condenser lens. and

~~a laser introduction section which allows a laser beam to be incident upon a direction crossing the optical path of the transmitted illuminative light at right angles and which introduces the incident laser beam on a condenser lens side in the vicinity of an outermost part of the transmitted illuminative light path.~~

2. (Currently Amended) The total internal reflection fluorescence microscope according to claim 1, ~~wherein the laser introduction section comprises~~ further comprising:

~~a reflection mirror which is movably disposed in the vicinity of an outermost part of the transmitted illuminative light path on an incidence side of the transmitted illuminative light in the condenser lens and which reflects the laser beam to introduce the laser beam on the condenser lens side; and~~

a light source that emits the transmitted illuminative light that is guided by the condenser lens into the sample;

a mirror moving section which moves the reflection mirror in a translatory manner along a direction parallel to an

~~introduction direction of the laser beam~~ that is substantially
perpendicular to a light path of the transmitted illuminative
15 light from the light source to the condenser lens.

Claim 3 (Canceled).

4. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 3 1, ~~wherein~~
~~the laser introduction section comprises~~ further comprising a
conversion lens unit which converts a numerical aperture of the
.5 laser beam incident upon ~~a~~ the condensing position without
changing the condensing position of the laser beam ~~by the~~
~~condensing lens.~~

5. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 4, wherein
the conversion lens unit is ~~detachably~~ removably inserted between
the an emission end of the optical fiber and the condensing lens.

6. (Withdrawn) The total internal reflection fluorescence
microscope according to claim 4, wherein the conversion lens unit
includes a lens group which converts a numerical aperture of the
laser beam incident upon the condensing position.

7. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 4, wherein the conversion lens unit comprises:

a convex lens which converts the numerical aperture of the laser beam diverged and emitted from ~~the~~ an emission end of the optical fiber; and

a concave lens which diverges the laser beam having the numerical aperture converted by the convex lens.

8. (Withdrawn) The total internal reflection fluorescence microscope according to claim 7, wherein the concave lens is movable in an optical path direction of the laser beam between the convex lens and the condensing lens.

9. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 5, wherein the at least one objective lens comprises a plurality of objective lenses having different observation magnifications, and the microscope further comprising comprises:

~~a plurality of objective lenses having different observation magnifications;~~

an objective lens switching section which selectively disposes one of the plurality of objective lenses on the observation optical path; and

a control section which controls ~~inserting/detaching~~
inserting and removing of the conversion lens unit between the
emission end of the optical fiber and the condensing lens in
accordance with the observation magnification of the objective
15 lens disposed on the observation optical path.

10. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 9, wherein
* the plurality of objective lenses include objective lenses at
least one objective lens for high-magnification observation and
5 at least one objective lens for low-magnification observation,
and

wherein the control section inserts the conversion lens unit
between the emission end of the optical fiber and the condensing
lens ~~in a case where~~ when the objective lens for
10 high-magnification observation is disposed on the observation
optical path, and ~~detaches~~ the control section removes the
conversion lens unit from between the emission end of the optical
fiber and the condensing lens ~~in a case where~~ when the objective
lens for low-magnification observation is disposed on the
15 observation optical path.

11. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 10, wherein

an irradiation range of the laser beam with respect to the specimen is ~~allowed~~ caused to agree with an observation range of the objective lens for high-magnification observation ~~in a case~~ ~~where~~ when the conversion lens unit is inserted between the emission end of the optical fiber and the condensing lens, and the irradiation range of the laser beam with respect to the specimen is ~~allowed~~ caused to agree with an observation range of the objective lens for low-magnification observation ~~in a case~~ ~~where~~ when the conversion lens unit is ~~detached~~ removed from between the emission end of the optical fiber and the condensing lens.

12. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 1, ~~wherein the laser introduction section comprises~~ further comprising a zoom lens unit which adjusts the condensing position of the laser beam in the vicinity of ~~a~~ the front focal position of the condenser lens.

13. (Withdrawn) The total internal reflection fluorescence microscope according to claim 12, wherein the zoom lens unit comprises a lens group which adjusts the condensing position of the laser beam in the vicinity of the front focal position of the condenser lens.

14. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 12, wherein the zoom lens unit comprises:

5 a convex lens which converts the numerical aperture of the laser beam diverged and emitted from ~~the~~ an emission end of the optical fiber; and

a concave lens which diverges the laser beam having the numerical aperture converted by the convex lens.

15. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 14, wherein the convex lens is movable in an optical path direction of the laser beam between the emission end of the optical fiber ~~emission end~~ and the condensing lens.

16. (Withdarwn) The total internal reflection fluorescence microscope according to claim 14, wherein the concave lens is movable in an optical path direction of the laser beam between the convex lens and the condensing lens.

17. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 14, further comprising:

a control section which determines a moving position of the
5 concave lens to adjust the condensing position of the laser beam
in the vicinity of the front focal position of the condenser lens
in accordance with ~~the~~ positional movement of the convex lens,
and which controls movement of the convex lens and the concave
lens based on information of the determined moving position of
10 the concave lens.

18. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 13, wherein
the at least one objective lens comprises a plurality of
objective lenses having different observation magnifications, and
5 the microscope further comprising comprises:

~~a plurality of objective lenses having different observation
magnifications;~~

an objective lens switching section which selectively
disposes one of the plurality of objective lenses on the
10 observation optical path; and

a control section which determines a relative positional
relation of the lens group disposed in the zoom lens unit in each
optical axis direction in accordance with an observation
magnification of the objective lens disposed on the observation
15 optical path.

19. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 18, wherein the lens group of the zoom lens unit comprises:

a convex lens which converts the numerical aperture of the laser beam diverged and emitted from ~~the~~ an emission end of the optical fiber; ~~emission end of the optical fiber;~~ and

a concave lens which diverges the laser beam having the numerical aperture converted by the convex lens, and

wherein the control section determines a moving position of the concave lens to adjust the condensing position of the laser beam in the vicinity of the front focal position of the condenser lens in accordance with ~~the~~ positional movement of the convex lens, and the control section controls movement of the convex lens and the concave lens based on information of the determined moving position of the concave lens.

20. (Withdrawn - Currently Amended) ~~A~~ The total internal reflection fluorescence microscope ~~comprising:~~ according to claim 1, wherein the laser oscillation unit, the optical fiber, the reflection mirror and the condensing lens form a laser introduction section, and the microscope comprises a plurality of said laser introduction sections, each of which emits a laser beam that is condensed at a corresponding condensing position in

a vicinity of corresponding front focal positions of the
condenser lens; and

10 wherein the microscope further comprises:

~~an objective lens which takes light from a specimen;~~

~~a plurality of at least one additional image pick-up devices~~
device which ~~pick~~ picks up an image of the light taken into the
objective lens;

15 at least one additional observation optical ~~paths~~ path via
which the light taken into the objective lens is condensed onto
~~each of the plurality of the additional image pick-up devices~~
device;

~~an optical dividing system which is disposed on the~~
20 ~~observation optical path to divide~~ divides the light ~~from the~~
~~specimen in the observation optical path by the plurality of~~
taken into the objective lens onto respective ones of the optical
paths toward the image pick-up devices depending on optical
characteristics of the light. 7

25 ~~a condenser lens which is disposed in a position facing the~~
~~objective lens via the specimen and which has a numerical~~
~~aperture that makes possible total internal reflection~~
~~illumination and which guides a transmitted illuminative light~~
~~into the specimen; and~~

30 ~~a plurality of laser introduction sections which allow a~~
~~plurality of laser beams to be incident upon a direction crossing~~

35 ~~the optical path of the transmitted illuminative light at right angles and which introduce the plurality of incident laser beams on a condenser lens side in the vicinity of an outermost part of the transmitted illuminative light path.~~

21. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 20, further comprising:

5 a light source that emits the transmitted illuminative light that is guided by the condenser lens into the sample;

wherein each of the plurality of laser introduction sections comprise comprises:

10 ~~a plurality of reflection mirrors which are movably disposed in the vicinity of an outermost part of the transmitted illuminative light path on an incidence side of the transmitted illuminative light in the condenser lens and which reflects the laser beam to introduce the laser beam on the condenser lens side; and a plurality of~~

15 a mirror moving sections section which move moves the plurality of reflection mirrors mirror in a translatory manner along a direction parallel to an introduction direction of the laser beam that is substantially perpendicular to a light path of the transmitted illuminative light from the light source to the condenser lens.

Claim 22 (Canceled).

23. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim ~~22~~ 21, wherein each of the plurality of laser introduction sections ~~comprise a plurality of~~ comprises a conversion lens ~~units~~ unit which ~~convert~~ converts a numerical aperture of the laser beam incident upon ~~a~~ the condensing position without changing the condensing position of the laser beam. ~~by the condensing lens.~~

24. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 23, wherein ~~the plurality of~~ each said conversion lens ~~units are detachably~~ unit is removably inserted between ~~the~~ an emission end of the optical fiber and the condensing lens in the corresponding one of the laser introduction sections.

25. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 23, wherein the ~~plurality of~~ each said conversion lens ~~units include~~ unit includes a plurality of lens ~~groups~~ group which ~~convert~~ converts a numerical aperture of the laser beam incident upon the corresponding condensing position.

26. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 23, ~~wherein the plurality of each said conversion lens units comprise unit~~ comprises:

5 a ~~plurality of convex lenses~~ lens which ~~convert~~ converts the numerical ~~apertures~~ aperture of the laser ~~beams~~ beam diverged and emitted from ~~the an~~ an emission ~~ends~~ end of the optical ~~fibers~~ fiber in the corresponding one of the laser introduction sections; and

10 a ~~plurality of concave lenses~~ lens which ~~diverge~~ diverges the laser ~~beams~~ beam having the numerical ~~apertures~~ aperture converted by the convex ~~lenses~~ lens.

27. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 26, wherein ~~the plurality of each said concave lenses are lens is~~ movable in an optical path ~~directions~~ direction of the laser ~~beams~~ beam between the convex ~~lenses~~ lens and the condensing ~~lenses~~ lens in the corresponding one of the laser introduction sections.

28. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 24, wherein the at least one objective lens comprises a plurality of objective lenses having different observation magnifications, and the microscope further comprising comprises:

~~a plurality of objective lenses having different observation magnifications;~~

an objective lens switching section which selectively disposes one of the plurality of objective lenses ~~on the observation optical path to take the light from the specimen;~~ and

a control section which controls ~~inserting/detaching inserting and removing~~ of the ~~plurality of conversion lens units~~ unit in each of the plurality of laser introduction sections between the emission ~~ends~~ end of the optical ~~fibers~~ fiber and the condensing ~~lenses~~ lens in accordance with the observation magnification of the objective lens disposed ~~on the observation optical path to take the light from the sample.~~

29. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 28, wherein a plurality of objective lenses include ~~objective lenses at least one objective lens~~ for high-magnification observation and ~~at least one objective lens~~ for low-magnification observation, and

~~wherein~~ the control section inserts the conversion lens ~~units~~ unit in each of the plurality of laser introduction sections between the emission ~~ends~~ end of the optical ~~fibers~~ fiber and the condensing ~~lenses in a case where~~ lens when the objective lens for high-magnification observation is disposed ~~on the observation optical path to take the light from the sample,~~

and ~~detaches~~ removes the conversion lens ~~units~~ unit in each of
the plurality of laser introduction sections between the emission
~~ends~~ end of the optical ~~fibers~~ fiber and the condensing ~~lenses~~ in
15 ~~a case where~~ lens when the objective lens for low-magnification
observation is disposed ~~on the observation optical path~~ to take
the light from the sample.

30. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 29,
wherein, for each of the laser introduction sections, an
irradiation range of the laser beam with respect to the specimen
5 ~~is allowed~~ caused to agree with an observation range of the
objective lens for high-magnification observation ~~in a case where~~
when the conversion lens ~~units are~~ unit is inserted between the
emission ~~ends~~ end of the optical ~~fibers~~ fiber and the condensing
~~lenses~~ lens, and the irradiation range of the laser beam with
10 respect to the specimen is ~~allowed~~ caused to agree with an
observation range of the objective lens for low-magnification
observation ~~in a case where~~ when the conversion lens ~~units are~~
~~detached~~ unit is inserted between the emission ~~ends~~ end of the
optical ~~fibers~~ fiber and the condensing ~~lenses~~ lens.

31. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 20, wherein

each of the plurality of laser introduction sections ~~comprise~~
further comprises a ~~plurality of~~ zoom lens ~~units~~ unit which
5 ~~adjust~~ adjusts the condensing position of the laser beam in the
vicinity of ~~a~~ the front focal position of the condenser lens.

32. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 31, wherein
~~the plurality of~~ each said zoom lens ~~units~~ comprise unit
comprises a ~~plurality of~~ lens ~~groups~~ group which ~~adjust~~ adjusts
5 the condensing position of the laser beam in the vicinity of the
front focal position of the condenser lens.

33. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 31, wherein
~~the plurality of~~ the lens group of each said zoom lens ~~units~~
~~comprise unit~~ comprises:

5 a ~~plurality of~~ convex ~~lenses~~ lens which ~~convert~~ converts the
numerical ~~apertures~~ aperture of the laser ~~beams~~ beam diverged and
emitted from ~~the~~ an emission end of the optical fiber in the
corresponding laser introduction section; ~~emission ends of the~~
~~optical fibers;~~ and

10 a ~~plurality of~~ concave ~~lenses~~ lens which ~~diverge~~ diverges
the laser ~~beams~~ beam having the numerical ~~apertures~~ aperture
converted by the convex ~~lenses~~ lens.

34. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 33, wherein ~~the plurality of each said convex lenses are lens~~ is movable in an optical path ~~directions~~ direction of the laser ~~beams~~ beam between the emission end of the optical fiber ~~emission ends~~ and the condensing ~~lenses~~ lens in the corresponding one of the laser introduction sections.

35. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 33, wherein ~~the plurality of each said concave lenses are lens~~ is movable in an optical path ~~directions~~ direction of the laser ~~beams~~ beam between the convex ~~lenses~~ lens and the condensing ~~lenses~~ lens in the corresponding one of the laser introduction sections.

36. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 33, further comprising:

a control section which determines, for each said zoom lens unit, a moving position of the concave lens to adjust the condensing position of the laser beam in the vicinity of the front focal position of the condenser lens in accordance with ~~the~~ positional movement of the convex lens, and which controls movement of the convex lens and the concave lens based on

10 information of the determined moving position of the concave
lens.

37. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 32, wherein
the at least one objective lens comprises a plurality of
objective lenses having different observation magnifications, and
5 the microscope further comprising comprises:

~~a plurality of objective lenses having different observation
magnifications;~~

an objective lens switching section which selectively
disposes one of the plurality of objective lenses ~~on the~~
10 ~~observation optical path to take the light from the specimen;~~ and

a control section which determines a relative positional
relation of the lens groups disposed in the zoom lens units in
each optical axis direction in accordance with an observation
magnification of the objective lens disposed on the observation
15 optical path.

38. (Withdrawn - Currently Amended) The total internal
reflection fluorescence microscope according to claim 37, wherein
~~the plurality of the lens group of each said zoom lens units~~
~~comprise unit comprises:~~

a ~~plurality of convex lenses~~ lens which ~~convert~~ converts the numerical ~~apertures~~ aperture of the laser ~~beams~~ beam diverged and emitted from ~~the~~ an emission end of the optical fiber in the corresponding laser introduction section; emission ends of the optical fibers; and

a ~~plurality of concave lenses~~ lens which ~~diverge~~ diverges the laser ~~beams~~ beam having the numerical ~~apertures~~ aperture converted by the convex ~~lenses~~ lens, and

wherein, for each of the zoom lens units, the control section determines a moving ~~positions~~ position of the concave ~~lenses~~ lens to adjust the condensing ~~positions~~ position of the laser ~~beams~~ beam in the vicinity of the front focal ~~positions~~ position of the condenser lenses in accordance with ~~the~~ positional ~~movements~~ movement of the convex ~~lenses~~ lens, and the control section controls movement of the convex ~~lenses~~ lens and the concave ~~lenses~~ lens based on information of the determined moving ~~positions~~ position of the concave ~~lenses~~ lens.

39. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 20, wherein ~~a~~ the plurality of laser introduction sections are disposed radially ~~centering on~~ around the transmitted illuminative light path and extend in ~~a direction crossing~~ directions that are

5

substantially perpendicular to a path of the transmitted
illuminative light. ~~path at right angles.~~

40. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 20, further comprising:

at least one optical path length adjustment section which is
5 disposed on at least one divided observation optical path among
the plurality of divided observation optical paths divided by the
optical dividing system and which ~~extends/contracts the~~ extends
and contracts an optical path length.

41. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 40, wherein the optical path length adjustment section comprises:

a fixed prism group fixed/disposed on the divided
5 observation optical path; and

a movable prism which is movable ~~in a leaving direction and~~
~~an approaching direction with respect to~~ away from and toward the
fixed prism group.

42. (Withdrawn) The total internal reflection fluorescence microscope according to claim 40, further comprising:

a control section which calculates/processes an extension/contraction of the optical path length by the optical path length adjustment section.

43. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 20, further comprising:

a plurality of shutters disposed in the plurality of laser introduction sections; and

a control section which controls ~~the opening/closing~~ opening and closing of the plurality of shutters to control introducing ~~or and~~ blocking of the laser ~~beam~~ beams from the laser introduction sections.

44. (Withdrawn - Currently Amended) The total internal reflection fluorescence microscope according to claim 20, wherein the plurality of laser introduction sections ~~comprise~~ includes at least two laser introduction sections which output ~~the laser beams having the equal~~ a same wavelength.

45. (New) A total internal reflection fluorescence microscope comprising:

at least one objective lens which takes light from a specimen;

5 an image pick-up device which picks up an image of the light
taken into the objective lens;

 an observation optical path via which the light taken into
the objective lens is condensed onto the image pick-up device;

 a condenser lens, which is disposed in a position facing the
10 objective lens via the specimen, which has a numerical aperture
that makes possible total internal reflection illumination, and
which guides a transmitted illuminative light into the specimen;

 a base including an upper portion that holds the condenser
lens;

15 a laser oscillation unit which outputs a laser beam; and

 a laser introduction section which comprises a reflection
mirror provided at a lower portion of the base to introduce the
laser beam output from the laser oscillation unit into a vicinity
of an outermost portion of the condenser lens.

46. (New) A total internal reflection fluorescence
microscope comprising:

 at least one objective lens which takes light from a
specimen;

5 an image pick-up device which picks up an image of the light
taken into the objective lens;

 an observation optical path via which the light taken into
the objective lens is condensed onto the image pick-up device;

10 a condenser lens, which is disposed in a position facing the
objective lens via the specimen, which has a numerical aperture
that makes possible total internal reflection illumination, and
which guides a transmitted illuminative light into the specimen;

a laser oscillation unit which outputs a laser beam; and

15 a laser introduction section which comprises a reflection
mirror provided integrally at a lower portion of the condenser
lens to introduce the laser beam output from the laser
oscillation unit into a vicinity of an outermost portion of the
condenser lens.